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PATENT APPLICATION  
Docket No.: NC 96,200

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of: Keller et al.

Serial No.: 10/808,264

Filed: 03/17/2004

For: OLIGOMERIC HYDROXY ARYLETHER PHTHALONITILES AND SYNTHESIS  
THEREOF

Examiner: Truong, Duc

Art Group Unit: 1711

Honorable Commissioner of Patents  
PO Box 1450  
Alexandria, VA 22313-1450

## DECLARATION UNDER 37 C.F.R. § 1.132 OF TEDDY M. KELLER

Sir:

I, Teddy M. Keller, hereby declare that:

1. I am a co-inventor of the invention claimed in the above-identified patent application.
2. My experience is in the field of polymer synthesis, and I believe that I am qualified to testify as an expert in this area. My CV is attached.
3. The Ullmann ether synthesis referred to in the Keller reference (US Patent No. 4,259,471) cannot be used to make oligomeric or polymeric aryl ethers in high yield and high molecular weight. The Ullmann ether synthesis has been used to form multiple aromatic ether containing compounds. The harsh reaction conditions (125-220°C in neat phenol or solvents such as pyridine, collidine, or DMF), the usual requirement for stoichiometric (or greater) quantities of the copper complex, and the fact that unactivated aryl halides usually react in low yields have limited the utility of this reaction for oligomeric and/or polymeric syntheses. For example, the reaction of disodium resorcinate with *m*-dibromobenzene in the presence of cuprous chloride afforded 1,3-diphenoxylbenzene in a 74% yield for the reaction in pyridine, whereas 20% yields were obtained in dipolar aprotic solvents such as DMF, DMSO, DMA, and HMPT. An excess of base used to form the diphenolate completely inhibits the reaction by destroying the copper catalyst. The water formed as a by-product during the Ullmann reaction is not removed from the reaction system. Attempts to form polyphenyl ethers using disodium resorcinate and *m*-

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dibromobenzene afforded tars. Failure to obtain polyphenyl ethers was ascribed to instability of the alkali metal salts of dihydric phenols at the temperature required for the reaction.

4. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

3/3/05

Date

Teddy M. Keller

Teddy M. Keller